REMARKS

Claims 1-23 are currently pending in this application. Claims 1, 20, and 23 have been amended, without prejudice, to more specifically define the claimed invention. Claim 22 has been withdrawn from consideration as being directed to a non-elected species of invention. The Title of the application has been amended to state "Resonant Scanning Probe Microscope." Applicants submit that no new matter has been introduced into the application by these amendments.

Objections to the Drawings

The drawings have been objected to for failure to particularly illustrate the following claimed elements: the scan lines (claims 1, 21, 23), the circular arrangement of scan lines (claim 19), the rectangular scan area (claims 17, 18), and monitoring a charge distribution in a semiconductor device (claim 20).

The "scan lines" and "scan area" refer to intangible reference positions with respect to the sample that are created by the probe tip. The means (22, 52) for oscillating either the probe (20, 54) or the sample (12) drives a relative oscillation, and the driving means (16, 22) drives a further relative translation. Therefore, the scan of the sample that is performed is defined in terms of imaginary "scan lines" that are "traced" across the sample surface by the probe tip. The aggregate of the scan lines traced is referred to as a "scan area." In other words, the "scan area" is the area of the sample that is addressed by the probe and therefore the area about which information is collected as the sample is scanned. The "scan area" may be

circular, rectangular, or other shape depending on how the driving means is operated. As such, "the scan lines," "the circular arrangement of scan lines," and "the rectangular scan area" are terms that all refer to intangible reference points that are created by the interaction of the probe tip and sample, which cannot be shown in the drawings.

The claimed limitation "monitoring a charge distribution in a semiconductor device," refers to an operation performed by the probe detection mechanism (24). An oscillating voltage is applied to the probe tip and the resulting electric field is sensitive to the local charge distribution within the semiconductor (see Specification at pg. 4, lines 12-15). Because this phrase refers to the operation of an element shown in the drawings, it should not be required to be shown in the drawings.

Objections to the Specification

The Examiner objected to the Title of this application as being non-descriptive. The Title has been amended to "Resonant Scanning Probe Microscope" and is believed to overcome the Examiner's objection. Withdrawal of the objection to the Title is respectfully requested.

Claim Rejections - 35 USC § 112, Second Paragraph

Claims 1-21 and 23 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The Examiner objected to claims 1, 21, and 23 stating that it is unclear what the phrase "each scan line being collected" means, it is unclear how oscillating acts to "collect" scan lines, and it is unclear what "their

arrangement" refers to. Independent claims 1 and 23 have been amended clarify the claim language to state, "each scan line is provided by oscillating either the probe (20, 54) or the sample (12) at or near its resonant frequency such that oscillation amplitude determines maximum scan line length and the arrangement of scan lines is provided by operation of the driving means (16, 22)."

It is noted to the Examiner that independent claim 21 does not include any of these rejected phrases. Therefore, Applicants have only amended independent claims 1 and 23 to address these rejections. It is further noted that withdrawn claim 22 includes these rejected phrases, and that Applicants' will amend claim 22 accordingly if re-entered into this application.

The Examiner objected to dependent claim 20 stating that "it is unclear how the microscope is adapted to monitor charge distribution in a semiconductor device as no additional structural limitation is presented." Claim 20 has been amended to state that it is the "capacitance of an interface between probe and sample which is used to monitor a charge distribution in a semiconductor device."

It is believed that the foregoing amendment to claims 1, 20, and 23 should obviate the Examiner's indefiniteness rejections, and withdrawal of these rejections is respectfully requested.

Claim Rejections – 35 U.S.C. § 102(e) and 35 U.S.C. § 103(a)

While the various prior art rejections will be addressed individually below, Applicants note that none of the cited prior art references teach or suggest the use

of a mechanical resonance to provide relative scanning motion between the sample and the probe; which is one of the key inventive features of the present invention. For example, independent claims 1 and 23 recite, "each scan line being provided by oscillating either the probe (20, 54) or the sample (12) at or near its resonant frequency such that oscillation amplitude determines maximum scan line length". The advantage of such an arrangement is twofold as discussed at pg. 3, line 14 – pg. 4, line 1 of the Specification. First, the scan can be completed much faster and data can be collected more rapidly as compared to prior art devices. Second, resonant oscillatory motion is highly stable, which reduces noise affecting the image and thereby permits further advantage to be taken of the potential for operating at a very high scanning speed.

1. **Claim 23**

Claim 23 has been rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,752,008 (Kley). Claim 23 recites, in pertinent part, "oscillating either the probe (20, 54) or the sample (12) at or near its resonant frequency" in order to effect a scan of the sample. Kley is distinguishable because it does not suggest or disclose exploiting a mechanical resonance to perform a scan of the sample. Kley is directed to a number of different scan patterns that can be followed by the probe as it moves relative to the sample (*see* Figs. 3A through 9B), including a sinusoidal scan pattern (*see* Figs. 4A and 4B). However, Kley does not teach or suggest that the scan pattern is achieved by use of resonant oscillation.

Moreover, Kley teaches away from using a resonant oscillation by describing the possibility of changing the period and amplitude of the sinusoidal pattern during a scan line (Kley at col. 8, lines 3-21), which is a feature that would not be possible in a microscope made in accordance with present invention.

Based on the arguments presented above, withdrawal of the § 102(e) rejection of claim 23 is respectfully requested.

2. Claims 1-4 and 6-21

Claims 1-4 and 6-21 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Kley in view of U.S. Patent No. 6,008,489 (Elings et al.). Independent claims 1 and 21 both recite, in pertinent part, "oscillating either the probe (20, 54) ... or the sample (12) at or near its resonant frequency".

As set forth above, Kley does not teach or suggest this claimed feature, and Elings does not resolve the shortcomings of Kley. Elings is directed to optimizing an oscillating/dynamic mode of operating an atomic force microscope (AFM). In the discussed mode of operation the probe of Elings is oscillated in a direction (z) perpendicular to the plane of the sample, which accordingly has no relevance as to how the scan is carried out across the plane of the sample (x, y). That is, the oscillation disclosed in Elings cannot be used to "carry out a scan of the sample surface" as required by the present invention.

Accordingly, the combination of Kley and Elings does not teach or suggest using a mechanical resonance of a component of a microscope to effect a scan of a

sample. Withdrawal of the obviousness rejection of claims 1-4 and 6-21 is respectfully requested.

3. Claim 5

Claim 5 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Kley in view of Elings and further in view of U.S. Patent No. 6,614,227 (Ookubo). Claim 5 depends from claim 1 (via claim 2), and therefore requires that essential feature of the present invention that he scan is achieved by oscillating either the probe (20, 54) ... or the sample (12) at or near its resonant frequency".

Kley and Elings are distinguishable from the present invention for the reasons set forth above, and Ookubo does not resolve the shortcomings of Kley. The resonator (101) identified by Ookubo is a microwave resonator for use in detecting the tip-sample interaction, and is not a mechanical resonator for effecting the scan.

Based on the arguments presented above, withdrawal of the obviousness rejection of claim 5 is respectfully requested.

Double Patenting Rejection

Claims 1, 21, and 23 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 26, and 38 of U.S. Patent Application No. 10/635,203. Because this is a provisional obviousness-type double patenting rejection, and the claims of this application are currently under substantive rejection, Applicants have not included a Terminal Disclaimer at this time. However, Applicants will file the required disclaimer at

such time that the claims of this application are in condition for allowance, if necessary to overcome this rejection.

Conclusion

In view of the foregoing remarks, Applicants respectfully submit that the present application, including claims 1-23, is in condition for allowance and a notice to that effect is respectfully requested.

If the Examiner believes that any additional minor formal matters need to be addressed in order to place this application in condition for allowance, or that a telephone interview will help to materially advance the prosecution of this application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

Respectfully submitted,

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